ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 4, Issue – 2, March - 2021, Page No. : 298 - 303

A correlation of chronic periodontitis with chronic renal disease using salivary urea and ph as biomarkers – a clinico-biochemical study

[1]Amit Mani, Department of Periodontology Professor, Rural Dental College, Pravara Institute of medical Sciences, Loni, India

[2]Shivkanya Bhadange, Department of Periodontology, Reader, RR Kambe Dental College and Hospital, MUHS, Akola, India

[3]Shubhangi Mani, Department of Ortodontics, Professor, Rural Dental College, Pravara Institute of medical Sciences, Loni, India

[4]Shivani Sachdeo, Department of Periodontology, Reader, Rural Dental College, Pravara Institute of medical Sciences, Loni, India

[5]Rujuta Mhaisekar, Department of Periodontology, Reader, Vaidik Dental College and Research Centre, Daman, Gujrat, India.

[6]Gaurav Shinde, Department of Pediatric Dentistry, Reader, RR Kambe Dental College and Hospital, MUHS, Akola, India

Corresponding Author: Shivkanya Bhadange, Department of Periodontology, Reader, RR Kambe Dental College and Hospital, MUHS, Akola, India

Citation of this Article: Amit Mani, Shivkanya Bhadange, Shubhangi Mani, Shivani Sachdeo, Rujuta Mhaisekar, Gaurav Shinde,"A correlation of chronic periodontitis with chronic renal disease using salivary urea and ph as biomarkers – a clinico-biochemical study", IJDSIR- March - 2021, Vol. – 4, Issue - 2, P. No. 298 – 303.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Interrelation between oral health and overall health is in both directions. Impact conditions and systemic diseases on oral health are recognized. In this regard, conditions commonly affecting various organs of the body may influence the periodontium.

Aims and objectives: To find out potential association of periodontal condition to renal condition and to explore the potential role of salivary urea and pH as intermediary explanatory variables that link the association between periodontitis and CRD.

Material and methods: the patients selected were in the age range 30–70 years, of whom 40 patients belonged to group A (test group) and 40 belonged to group B (control group). Group I comprised of 40 patients diagnosed as CRD. Group II comprises 40 patients without chronic renal disease.

Summary and conclusion: On the basis of results obtained, following conclusion can be drawn

1. There is a positive correlation between Chronic Periodontitis and chronic renal failure.
2. Salivary urea and salivary pH play an important role increasing the amount of calculus and thereby the chronic periodontal disease.
3. Oral hygiene status of chronic renal patients is low as compared with the healthy patients.
4. Salivary urea can be used as primary diagnostic tool for chronic renal disease as it is non-invasive and easy to perform.

Keywords: chronic periodontitis, Chronic Renal failure, Salivary pH, Salivary urea

Introduction

Oral health is integral to overall health and cannot be separated from the entire general. Interrelation between oral health and overall health is in both directions. Periodontal diseases are chronic, predominantly Gram-negative infections of the oral cavity that are initiated in, the gingiva and, if untreated, lead to alveolar bone destruction and eventual tooth loss[1.2]. Collectively, periodontal diseases affect over 70 percent of the adult population[3]. During the past two decades, a field of periodontal research known as "periodontal medicine" has emerged[4], investigating the link between periodontal disease and other systemic diseases. Recent evidence suggests that there may be an association between periodontal infections and several systemic conditions including diabetes [5], pneumonia[6], cardiovascular disease[7], and adverse pregnancy outcomes[8], although other investigators have found conflicting results[9,10]. For more than a century, clinical researchers have been investigating the biologic mechanism that could explain the link between periodontal infections and systemic inflammatory diseases. In 1900, Hunter proposed the "Focal lnfection Theory" [11], which supports the role of bacterial by-products from a chronic, localized infection that could be disseminated throughout the body and cause disease in other organs[12]Impact conditions and systemic diseases on oral health are recognized. Pathologies with impaired renal function, evolving themselves as determined by features of tissue reactions manifested by delayed healing, and greater susceptibility to infections that endanger the patient's life. The picture becomes more complex when it consider the amount of endocrine metabolic disorders associated kidney failure, and they in turn causes a variety of changes in the periodontal tissues. Periodontal diseases, by their infectious nature, are a major risk factor for renal patient. A posse of professionals, group of clinicians and scientists worked for year together to draw a relationship of periodontal diseases and systemic diseases. Yet, the controversy on whether the relation is true or not continues to baffle academia. Therefore, an attempt is made to find out the relation between Periodontal diseases and Chronic Kidney Disease.

Material and methods

In this observational case control study, 80 patients were selected on purposive selection criteria from the Outpatient Department of General Medicine and Department of Periodontology. The patients selected were in the age range 30–70 years, of whom 40 patients belonged to group A (test group) and 40 belonged to group B (control group). Group I comprised of 40 patients diagnosed as CRD. Group II comprises 40 patients without chronic renal disease.

Group I: Inclusion Criteria

Forty patients diagnosed as CRD by the physician

- Dentate patients
- Age group 30–70 year

Group I: Exclusion criteria

- If patients had undergone periodontal therapy for last 3 months

- Patients on medications (antibiotics) known to influence the periodontal tissues for last 6–8 weeks
- Patients with any other systemic diseases

Group II: Inclusion criteria

- Forty patients without renal disease
- Dentate patients
- Age group 30-70 years

Group II: Exclusion criteria

- Edentulous patients
- Patients had undergone periodontal therapy for last 3 months
- Patients on antibiotic therapy for last 6–8 weeks
- Patients with any other systemic diseases

Kidney disease/condition

- The physician has made the diagnosis of renal diseases and non-renal diseases. A detailed case history, physical examination and investigations like complete blood count, urine examination, renal function test will be done by medical department. After confirmation of CRF as diagnosis, these patients will be taken for the study.
- Demographic variables include age, gender, which also will be considered in this study. Lifestyle characteristics include history of smoking and alcohol consumption. A thorough medical history of each patient is recorded. In addition, any patient found with other chronic systemic diseases is excluded from the study.

All 80 patients of groups I and II have been examined for gingival and periodontal status by recording the following criteria:

- Oral hygiene index- simplified
- Russells periodontal index
- Clinical Attachment Level
- Assessment of salivary urea and pH

Results and discussion

Like any other systemic conditions, chronic renal failure (CRD) can cause oral manifestations. Patients with CRD may present unique signs i.e. multi-systemic disease that affects the kidneys (such as vasculitis or diabetes) or frequent oral pathology found in the increased prevalence of oral diseases in patients with CRD. The prevalence of oral lesions is affected by systemic illness which accompanies them.

Therefore, patients receiving hemodialysis although have some degree of immunosupression, they still can get a similar response to existing plaque that of their counterparts systemically healthy, on the periodontal agents pathogens. Therefore, chronic renal failure appears to be additional risk factor for severe periodontal damage. Evaluation of the oral hygiene status parameters revealed that, Oral Hygiene Index (OHl) scores was highly significant correlation in the CRD group. Oral Hygiene index scores were highly significant in CRD groups than Non CRD subjects. As per the results the mean values of OHl scores in non CRD group was 1.59 ± 0.89 and in CRD group was 2.42 ± 0.69 p value < 0.001, a highly significant difference was found between two groups.

Evaluation of the periodontal status parameters revealed that Russell's Index (Pl) scores were highly significant correlation in the CRD group. These scores were highly significant in CRD group compared to non CRD group. As per the results the mean values of Pl scores in non CRD group was 1.48±1.13 and in CRD group 2.38 ± 1.37 which denotes the value <0.001 which is highly significant. The mean values of Avg CAL scores in non CRD group was 2.36 ± 2.34 and in CRD group was 4.05 ± 2.51. p<0.001, a highly significant difference was found between two groups. Our findings are similar to those among all adults in NHANES III (1988 to 1994), in whom

periodontal disease and edentulism were associated with a 1.6 and 1.9 greater risk of CRD, respectively[13].

The urea in saliva diffuses into plaque and can be converted by certain bacteria into ammonia and CO2, causing a rise in plaque pH. The urea levels in saliva (about 3 mmol/L) are such that, in the fasted state, the pH of plaque may be higher than that of the saliva flowing over it, particularly at sites with good access to saliva. Using a physical model of plaque with ureolytic ability, it has also been shown that the pH of the plaque is positively correlated with the salivary film velocity at normal levels of salivary urea. Plaque in regions of the mouth with better access to saliva also contains higher proportions of ureolytic bacteria, which will facilitate development of a more alkaline plaque.[14]

Mean Salivary urea of CRD group is 123.12 ± 34.37 and Mean salivary urea of Non CRD group is 11.3 ± 1.14. P value is 0.00 so salivary urea is highly significant.

Mean Salivary pH of CRD group is 8.02 ± 0.41 and Mean salivary urea of Non CRD group is 7.02± 0.15. P value is 0.00 so salivary pH is highly significant. This could be explained by the fact that in CRD patients the uremic milieu creates an alkaline environment which favours multiplication of proteolytic periodontal pathogens. Moreover, patients with CRD might have an increased risk for infections because of the immune-compromised state seen in a uremic milieu[15].

Table 1: Comparison of renal disease patients with healthy patients

	Group	N	Mean	Std. Deviation	Mean difference	P
Serum urea	Renal disease	40	145.41	38.16	133.63	0.000 (S)
	Healthy	40	11.77	1.51		
Serum creatinine	Renal disease	40	6.71	1.84	5.9	0.000 (S)
	Healthy	40	0.81	0.11		
Salivary urea	Renal disease	40	123.12	34.37	111.99	0.000 (S)
	Healthy	40	11.13	1.136		
Salivary pH	Renal disease	40	8.02	0.41	1	0.000 (S)
	Healthy	40	7.02	0.15		
OHI-S	Renal disease	40	2.42	0.69	0.825	0.000 (S)
	Healthy	40	1.59	0.89		
PI	Renal disease	40	2.38	1.37	0.89	0.002 (S)
	Healthy	40	1.48	1.13		
CAL	Renal disease	40	4.05	2.51	1.7	0.002 (S)
	Healthy	40	2.35	2.34		

Test applied: Unpaired t test. S=significant

Table showed comparison group of renal disease and healthy patients among varies study variables. With more number of mean study variables like serum urea (145.41), serum creatinine (6.71), salivary urea (123.21), salivary pH (8.02), OHI-S (2.42), PI (2.38) and CAL (4.05) showed statistically significant results ($p<0.05$) in renal disease patients. Renal disease patients showed positive finding as compare to healthy patients.

Table 2: Comparison of periodontal disease among kidney disease patients

	Periodontal disease	N	Mean	Std. Deviation	
Serum urea	Present	28	156.05	38.53	0.005 (S)
	Absent	12	120.58	23.64	
Serum creatinine	Present	28	7.203	1.94	0.008 (S)
	Absent	12	5.57	0.82	
Salivary urea	Present	28	129.21	36.94	0.08
	Absent	12	108.91	22.92	
Salivary Ph	Present	28	8.05	0.48	0.51
	Absent	12	7.95	0.16	
OHI-S	Present	28	2.76	0.52	0.000 (S)
	Absent	12	1.62	0.23	
PI	Present	28	3.16	0.77	0.000 (S)
	Absent	12	0.55	0.206	
CAL	Present	28	5.607	0.86	0.000 (S)
	Absent	12	0.43	0.27	

Test applied: Unpaired t test. S=significant

Table showed comparison of periodontal disease among kidney disease patients. Present periodontal disease patients showed more number of serum urea (156.5) and creatinine (7.2) which showed statistically significant results ($p<0.05$). Clinical variable like OHI-S (2.76), PI (3.16) and CAL (5.607) also showed statistically significant results ($p<0.05$) among periodontal disease patients. Serum urea and serum creatinine showed more positive results with periodontal disease patients.

Summary and conclusion

On the basis of results obtained, following conclusion can be drawn

1. There is a positive correlation between Chronic Periodontitis and chronic renal failure.
2. Salivary urea and salivary pH play an important role increasing the amount of calculus and thereby the chronic periodontal disease.
3. Oral hygiene status of chronic renal patients is low as compared with the healthy patients.

4. Salivary urea can be used as primary diagnostic tool for chronic renal disease as it is non-invasive and easy to perform.

Future Directions

Periodontitis, a treatable infective dental condition, potentially places a devastating chronic systemic inflammatory burden on the CKD population, resulting in significant atherosclerotic complications and death. In the same way, chronic renal disease impacts on oral health in this population with gingival overgrowth as the most prevalent finding due to a cyclosporine-mediated mechanism. Several studies concluded that proper periodontal intervention rendered a promising outcome in the systemic improvement of CKD subjects although its impact on cardiovascular complications remained to be further explored. Thus, PD diagnosis and management deserve better awareness. Further investigation, especially prospective randomized controlled trials, with intervention should be conducted to allow more accurate evaluation. Also, a larger number of participants and ethnic subgroups are required to be recruited in the research to provide more data to make firmer conclusions.

References

1. Nishihara, T. and T. Koseki, Microbial etiology of periodontitis. Periodontol 2000, 2004;36:14-26.
2. Schenkein, H .A., Host responses in maintaining periodontal health and determining periodontal disease. Periodontol 2000, 2006;40:77-93
3. Albandar, J.M., J.A. Brunelle, and A. Kingman, Destructive periodontal
4. disease in adults 30 years of age and older in the United States, 1988-1994. J Periodontol 1999;70(1):13-29.
5. Williams, R.C. and S. Offen bacher, Periodontal medicine: the emergence of a new branch of periodontology. Periodontol 2000, 2000;23:9-1 2.
6. Papapanou, P. N., Periodontal diseases: epidemiology. Ann Periodontol, 1996;l(1): 1-36.
7. Scannapieco, F.A., R.B. Bush, and S. Paju, Associations between periodontal disease and risk for nosocomial bacterial pneumonia and chronic obstructive pulmonary disease. A systematic review. Ann Periodontol, 2003;8(1):54-69.
8. Beck, J., et al., Periodorital disease and cardiovascular disease. J Periodontol, 1996;67:1123-37.
9. Offenbacher, S., et al., Periodontal infection as a possible risk factor for preterm low birth weight. J Periodontol, 1996;67:1103-13
10. Michalowicz, B.S., et al., Treatment of periodontal disease and the risk of preterm birth. N Engl J Med, 2006;355(18):1885-94.
11. Vettore, M .V., et al., The relationship between periodontitis and preterm low birthweight. J Dent Res, 2008;87(1):73-8.
12. Hunter, W., Oral sepsis as a cause of disease. Br Med J , 1900:215-6.
13. Newman, H.N., Focal infection. J Dent Res, 1996;75(12):1912-9.
14. Fisher, M .A., et al., Periodontal disease and other nontraditional risk factors for CKD. Am J Kidney Dis, 2008;51(1):45-52.
15. Colin Dawes. Why Does Supragingival Calculus Form Preferentially on the Lingual Surface ofthe 6 Lower Anterior Teeth? J Can Dent Assoc 2006; 72(10):923–6
16. C. Kurts, U. Panzer, H.-J. Anders, and A. J. Rees, “The immune system and kidney disease: basic concepts and clinical implications,” *Nature Reviews Immunology*, vol. 13, no. 10, pp. 738–753, 2013.